

## REMARKS

### Status of Claims

By this Amendment, Claims 1-19 are canceled and new Claims 20-42 added. With this Amendment, Claims 20-42 are pending in this application.

Applicants respectfully submit that support for new Claims 20-42 can be found in the specification and in the originally filed claims, including but not limited to:

Claim		Support in Specification	Support in Originally Filed Claims
20	A method of hydrolyzing a cyanohydrin to its corresponding $\alpha$ -hydroxycarboxylic acid in a reaction mixture comprising:	Page 3, paragraph 5; Page 6, paragraph 2; Examples 1 - 4	Claim 1
	the cyanohydrin;	Page 6, paragraph 3 through page 17, paragraph 1; Formula I, page 6; Formula (III), page 30; Formula (IV), page 33	
	water;	Page 18, paragraph 6	
	at least one mineral acid that catalyzes the hydrolysis; and	Page 3, paragraph 7; Page 17, paragraphs 2-3	Claim 3
	at least one hydrocarbon solvent;	Page 17, paragraph 4; Page 18, paragraph 5	Claim 1
	wherein the reaction mixture comprises less than 10% by weight of an organic solvent other than the at least one hydrocarbon solvent.	Page 4, paragraph 4; Page 31, paragraph 4; Examples 1A - 3'; Table 3	Claim 5
21	The method of claim 20, wherein the reaction mixture comprises less than 5% by weight of an organic solvent other than the at least one hydrocarbon	Page 31, paragraph 4	

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	solvent.		
22	The method of claim 20, wherein the amount of water in the reaction mixture ranges from 7 equivalents to 50 equivalents relative to the cyanohydrin.	Page 19, paragraph 1	
23	The method of claim 20, wherein the amount of water in the reaction mixture ranges from 10 equivalents to 40 equivalents relative to the cyanohydrin.	Page 19, paragraph 1	
24	The method of claim 20, wherein the amount of the at least one mineral acid in the reaction mixture ranges from 1.5 equivalents to 10 equivalents relative to the cyanohydrin.	Page 17, paragraph 3	
25	The method of claim 20, wherein the amount of the at least one mineral acid in the reaction mixture ranges from 2 equivalents to 7 equivalents relative to the cyanohydrin.	Page 17, paragraph 3	
26	The method of claim 20, wherein the at least one mineral acid is selected from hydrochloric acid, sulfuric acid, boracic acid, phosphoric acid, and perchloric acid.	Page 17, paragraph 2	Claim 3
27	The method of claim 20, wherein the at least one hydrocarbon solvent is selected from a saturated or unsaturated linear or branched chain hydrocarbon comprising 5 to 16 carbon atoms, a saturated or unsaturated cyclic hydrocarbon with or without a side chain comprising 6 to 16 carbon atoms, and a saturated or unsaturated linear or branched chain hydrocarbon substituted with a cyclic hydrocarbon comprising 5 to 16 carbon atoms.	Page 17, paragraph 4 through page 18, paragraph 3	
28	The method of claim 20, wherein the at least one hydrocarbon solvent comprises an aromatic hydrocarbon	Page 18, paragraphs 2-3	

	comprising 6 to 16 carbon atoms.		
29	The method of claim 28, wherein the aromatic hydrocarbon is selected from benzene, toluene, and xylene.	Page 18, paragraph 3	
30	The method of claim 20, wherein the maximum temperature of the hydrolysis reaction ranges from 40 °C to 90 °C.	Page 19, paragraph 2; Page 32, paragraph 2	
31	The method of claim 20, wherein the maximum temperature of the hydrolysis reaction ranges from 50 °C to 80 °C.	Page 19, paragraph 2	
32	The method of claim 20, further comprising separating and removing the hydrocarbon solvent phase from the reaction mixture following the hydrolysis reaction.	Page 19, paragraph 3; Page 3, paragraph 6	Claim 2
33	A method of hydrolyzing a cyanohydrin to its corresponding $\alpha$ -hydroxycarboxylic acid in a reaction mixture comprising:	Page 3, paragraph 5; Page 6, paragraph 2; Examples 1 - 4	
	the cyanohydrin;		
	water wherein the amount of water comprising the reaction mixture ranges from 10 equivalents to 40 equivalents relative to the cyanohydrin;	Page 19, paragraph 1	
	at least one mineral acid selected from hydrochloric acid, sulfuric acid, boracic acid, phosphoric acid, and perchloric acid,	Page 17, paragraph 2	
	wherein the amount of the at least one mineral acid in the reaction mixture ranges from 2 equivalents to 7 equivalents relative to the cyanohydrin; and	Page 17, paragraph 3	
	at least one aromatic solvent selected	Page 18, paragraph 3	

	from benzene, toluene, and xylene;		
	wherein the reaction mixture comprises less than 5% by weight of an organic solvent other than the hydrocarbon solvent, and	Page 31, paragraph 4;	
	wherein the maximum temperature of the hydrolysis reaction ranges from 50 °C to 80 °C.	Page 19, paragraph 2	
34	A method of crystallizing optically active $\alpha$ -hydroxycarboxylic acid in an aqueous solution comprising:	Page 45, paragraph 3; Examples 1S - 5S and Table 5	Claim 8
	suspending the optically active $\alpha$ -hydroxycarboxylic acid in an aqueous solution; and	Page 45, paragraph 3	
	cooling the aqueous solution to a temperature of less than 30 °C at a rate of 0.5 °C/min or less, to produce crystalline optically active $\alpha$ -hydroxycarboxylic acid.	Page 45, paragraph 3	
35	The method of claim 34, wherein the aqueous solution comprises at least one non-miscible organic solvent.	Page 45, paragraph 3	Claim 9
36	The method of claim 35, wherein the at least one non-miscible organic solvent comprises at least one hydrocarbon solvent.	Page 45, paragraph 3	
37	The method of claim 36, wherein the at least one hydrocarbon solvent is selected from benzene, toluene, o-xylene, m-xylene, p-xylene, n-hexane, n-heptane, and n-octane.	Page 45, paragraph 3	
38	The method of claim 35, wherein the ratio of the volume of the aqueous solution to the volume of the non-miscible organic solvent ranges from 1 : 0.05 to 1 : 1.	Page 45, paragraph 3	

39	The method of claim 34, wherein the crystalline optically active $\alpha$ -hydroxycarboxylic acid exhibits a packing density of at least 0.5 g/cm <sup>3</sup> .	Page 46, paragraph 2	
40	The method of claim 34, wherein the crystalline optically active $\alpha$ -hydroxycarboxylic acid exhibits a packing density of at least 0.6 g/cm <sup>3</sup> .	Page 46, paragraph 2	
41	The method of claim 34, wherein the optically active $\alpha$ -hydroxycarboxylic acid is produced according to the method of Claim 20.	Page 45, paragraph 4	Claim 11
42	The method of claim 34, wherein the optically active $\alpha$ -hydroxycarboxylic acid is produced according to the method of Claim 33.	Page 45, paragraph 4	

Accordingly, this Amendment adds no new matter.

Rejection Under 35 U.S.C. § 112, First Paragraph

The Office rejects canceled Claims 1-3, 7-9, 11, and 13-19 under 35 U.S.C. § 112, first paragraph. Although the Office's rejection of canceled Claims 1-3, 7-9, 11, and 13-19 under 35 U.S.C. § 112, first paragraph, is rendered moot by Applicants' Amendment canceling Claims 1-19, Applicants herein address the rejection to clarify the language of the new claims vis-à-vis the specification.

Applicants respectfully suggest that the Office has not met its burden under the enablement requirement of 35 U.S.C. § 112, first paragraph. Specifically, as set forth in the MPEP, the specification "must be taken as being in compliance with the enablement requirement of 35 U.S.C. 112, first paragraph, unless there is reason to doubt the objective truth of the

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statements contained therein which must be relied on for enabling support.” *MPEP*, 2164.04 at 2100-183. Moreover, “it is incumbent upon the Patent Office, whenever a rejection on this basis is made to explain *why* it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement.” *Id.* (emphasis original). The Office has not set forth any support. All that is said on the rejection is that “[t]he specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to include all the cyanohydrins unrelated to the invention commensurate in scope with these claims,” and all that is said in the Final Action is that “[t]he rejection of Claims 1-3, 7-9, 11, and 13-19 under 35 U.S.C. § 112, first paragraph, has been maintained due to applicants’ failure to change the amendment.” In light of Applicants’ extensive disclosure on cyanohydrins, the present claims are fully enabled.

The Office maintains the rejection of canceled Claims 1-3, 7-9, 11, and 13-19 under 35 U.S.C. § 112, first paragraph, as put forth in the Office Action mailed February 12, 2003. In that Office Action, the Office rejects canceled Claims 1-3, 7-9, 11, and 13-19 as “not reasonably provide[ing] enablement for all cyanohydrins known in the field of chemistry.” New independent Claims 20 and 33 recite “[A] method of hydrolyzing a cyanohydrin to its corresponding  $\alpha$ -hydroxycarboxylic acid.” Applicants’ new independent claims 20 and 33 are directed to hydrolyzing a cyanohydrin to the  $\alpha$ -hydroxycarboxylic acid corresponding to the cyanohydrin. Thus, the claims expressly encompass only those cyanohydrins that can be hydrolyzed to their corresponding  $\alpha$ -hydroxycarboxylic acid. Moreover, the specification provides extensive disclosure of cyanohydrins of the formula (I) at page 6 to page 17, cyanohydrins of the formula (III) at page 30, and cyanohydrins of the formula (IV) at page 33 to

page 43. Thus, Applicants have provided a disclosure of cyanohydrins within the specification that is at least commensurate in scope with the invention as claimed.

In view of the foregoing, the scope of the  $\alpha$ -hydroxycarboxylic acid recited in independent Claims 20 and 33 is enabled by Applicants' originally filed specification.

For at least these reasons, Applicants respectfully request the Office withdraw the rejection under 35 U.S.C. § 112, first paragraph.

Claim Rejections Under 35 U.S.C. § 103(a) over Effenberger, et al. (Tetrahedron Letters, p. 2605-2608) in view of Kawabe, et al. (U.S. Patent No. 5,763,652)

The Office rejects canceled Claims 1-3, 7-9, 11, 13, 14, 17, and 18, under 35 U.S.C. § 103(a) as being unpatentable over Effenberger, et al. (Tetrahedron Letters, p. 2605-2608) in view of Kawabe, et al. (U.S. Patent No. 5,763,652). (Final Action, page 2).

The Office alleges that Effenberger, et al. teach a method of producing (R)-  $\alpha$ -hydroxy-alpha-methyl heptanoic acid by hydrolyzing a (R)- $\alpha$ -hydroxy-alpha-methyl-heptane nitrile in the presence of hydrochloric acid and a hexane solvent. The Office further alleges that Kawabe, et al. teach the process for producing an alpha-carboxylic acid by hydrolyzing the alpha-cyanohydrin in the presence of an acidic catalyst and a hydrocarbon solvent such as hexane, benzene, or xylene. Thus, the Office bases the rejection on the teachings that both Effenberger, et al. and Kawabe, et al. teach producing an alpha-hydroxycarboxylic acid in the presence of a hydrocarbon solvent.

Applicants respectfully traverse.

"To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to

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combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference . . . must teach or suggest all claim limitations.” *MPEP* § 2143 at 2100-124.

Effenberger, et al. teach the oxynitrilase catalyzed synthesis of (R)-cyanohydrins in organic solvents (page 2605, third paragraph). Effenberger, et al. further teach the hydrolysis of the cyanohydrin from the corresponding (R)- $\alpha$ -hydroxy carboxylic acid by adding concentrated hydrochloric acid to the reaction mixture used to produce the (R)-cyanohydrin “without isolation of the cyanohydrins.” (page 2607, paragraph 2; and reference 15). The only organic solvent disclosed by Effenberger, et al. in the synthesis of (R)-cyanohydrin and (R)- $\alpha$ -hydroxycarboxylic acid is diisopropyl ether. (reference 8).

Kawabe, et al. teach that the hydrolysis of a nitrile compound to produce the corresponding carboxylic acid can be carried out in an inert solvent including aliphatic hydrocarbons, aromatic hydrocarbons, halogenated hydrocarbons, alcohols, esters, ethers, ketones, and aprotic solvents. (col. 7, line 66 through col. 8, line 11). In Example 3, Kawabe, et al. specifically teach the use of “the organic layer obtained in the amide extracting step (iv)” (col. 22, lines 2-3) which layer comprises methyl ethyl ketone (col. 21, lines 55-56), in the hydrolysis step.

Applicants claim a method of hydrolyzing a cyanohydrin to its corresponding  $\alpha$ -hydroxycarboxylic acid in a reaction mixture comprising the cyanohydrin, water, at least one mineral acid that catalyzes the hydrolysis, and at least one hydrocarbon solvent, wherein the reaction mixture comprises less than 10% by weight of an organic solvent other than the at least one hydrocarbon solvent.



Although Effenberger, et al. and Kawabe, et al. teach the presence of organic solvents in the hydrolysis of a nitrile compound such as cyanohydrin to its corresponding  $\alpha$ -hydroxycarboxylic acid, neither reference suggests hydrolyzing the nitrile compound in a reaction mixture comprising less than 10% by weight of an organic solvent other than a hydrocarbon solvent. Furthermore, Effenberger, et al. and Kawabe, et al. disclose using the organic solvent used to prepare the nitrile compound in the hydrolysis reaction without first removing or reducing the amount of organic solvent in the hydrolysis reaction mixture. As the teaching disclosed by both references use organic solvents other than hydrocarbon solvents in their hydrolysis reactions, the references teach away from use of hydrolysis reaction mixtures comprising less than 10% by weight of organic solvents other than hydrocarbon solvents.

For at least these reasons, Applicants' new independent Claims 20 and 33 are non-obvious under 35 U.S.C. § 103(a) over Effenberger, et al. in view of Kawabe, et al.

Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) over Effenberger, et al. in view of Kawabe, et al.

Since independent Claims 20 and 33 are herein shown to be non-obvious over Effenberger, et al. in view of Kawabe, et al., dependent claims which depend from independent Claims 20 and 33 are herein shown to be non-obvious over Effenberger, et al. in view of Kawabe, et al. *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988) (If an independent claim is non-obvious under 35 U.S.C. § 103, then any claim depending therefrom is also non-obvious.).

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Claim Rejections under 35 U.S.C. § 103(a) over Bock, et al. (U.S. Patent No. 4,177,342)

The Office rejects Claims 15-16 under 35 U.S.C. § 103(a) as being unpatentable over Bock, et al. (U.S. Patent No. 4,177,342) for the reasons put forth in “paper no. 17.” (see Final Action, page 3).

Applicants respectfully traverse the Office’s rejections.

Applicants have reviewed the Office Actions and Information Disclosure Statements submitted in this application and are unable to find any reference to Bock, et al. (U.S. Patent No. 4,177,342) or to “paper no. 17.”

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) over Bock, et al.

Claim Rejections under 35 U.S.C. § 103(a) over Fiege, et al. (U.S. Patent No. 4,218,380)

The Office maintains the rejection of Claim 19 under 35 U.S.C. § 103(a) as being unpatentable over Fiege, et al. (U.S. Patent No. 4,218,380) as put forth in “paper no. 17.”

Applicants make the assumption that paper no. 17 refers to the Office Action mailed February 12, 2003. (Final Action, page 3; Office Action mailed February 12, 2003, page 7).

Applicants’ canceled Claim 19 is directed to an optically active chloromandelic acid having a certain packing density. Applicants’ cancellation of Claim 19 renders the Office’s rejection over Fiege, et al. moot.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) over Fiege, et al.

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## CONCLUSION

In view of the foregoing Amendment and Remarks, Applicants respectfully submit that the claimed invention is neither anticipated by nor rendered obvious in view of the prior art references cited against this application. Applicants therefore request the Office's reconsideration of the application and the timely allowance of the claims.

Please grant any extensions of time required to enter this response.

If there is any additional fee due in connection with the filing of this Amendment, please charge the fee to Deposit Account No. 06-0916.

Respectfully submitted,

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Dated: February 17, 2004

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